

國立彰化師範大學 102 學年度碩士班招生考試試題

系所： 機電工程學系

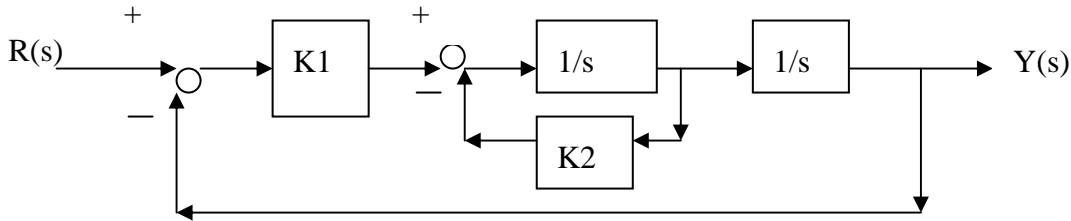
組別： 甲組(選考甲)

科目： 自動控制

☆☆請在答案紙上作答☆☆

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1. A D.C. motor control system has the form of



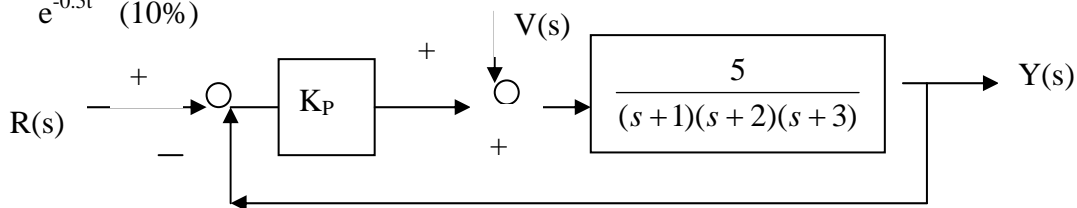
Find the differential equation relating the command $r(t)$ to the response $y(t)$ and the transfer function relating the input to output (15%)

2. Solve the steady state response of the following transfer function if the input is an impulse signal (10%)

$$\frac{\theta_o(s)}{\theta_i(s)} = \frac{s + 1000}{s^2 + 0.1s + 100}$$

3. See the following block diagram and answer a, b, c, d, e, and f.

- Find the differential equation relating $y(t)$ to $r(t)$ and $V(t)$. (5%)
- Find the steady state error in response to the $r(t)=1$, if $V(t)=0$ and if the controller gain K_P can approach infinite. (5%)
- Find the error due to an unit disturbance ($V(t)=1$) if $r(t)=0$ and K_P is 100. (5%)
- Find the value of gain k_P that produce less than 5% error when $r(t)=1$ and $V(t)=0$. (5%)
- Find the range of K_P for asymptotic stable, so that the transient response of the y_H homogeneous solution decays. (5%)
- Find the range of K_P that produces all solutions of homogeneous equation decaying at least as fast as $e^{-0.5t}$ (10%)



4. Plot the Root locus plot of the following open loop transfer function: (15%)

$$T(s) = \frac{K}{(s + 2)(s^2 + 12s + 45)}$$

5. Plot the Bode plot based on the magnitude and phase vs. frequency (25%)

$$G(s) = \frac{(s + 3)}{s(s + 1)(s + 2)}$$